Digitization of Traditional Indonesian Music for Preservation and Democratization of Knowledge

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Abstract—*Indonesia's geographical position contributes directly to its cultural diversity, whether those that arose independently or from cross fertilization from intercontinental trade actors. Among the cultural diversity is the existence of various musical instruments and genre referred to as traditional music. Considering recent development of the human civilization, digitization of this traditional music is necessary for the purpose of preservation and also fast and accurate introduction to the world. In researching the right digitization, a qualitative method is used to find the most optimal way for documentation of traditional music.*

Keywords— *Traditional music; traditional musical instruments; traditional songs.*

I. INTRODUCTION

As a country with the fourth largest population in the world (Central Intelligence Agency, 2023), Indonesia has a cultural wealth that is showcased by the existence of more than 700 local languages (Simons et al., 2019) and more than 1300 ethnic groups (Na'im & Syaputra, 2010). Indonesia's cultural diversity is also reflected in its music. Indonesia has distinctive musical instruments such as gamelan, talempong, suling, kulintang, kecapi, kendang, angklung, sasando, sape, and many more (Hastawan et al., 2019: 93). Meanwhile, in terms of genre, Indonesia is the place of numerous musical styles such as gambang kromong (Betawi), keroncong (Jakarta), gong luang (Bali), karang dodou (Kalimantan Timur), angklung buhun (Jawa Barat), tabuh salimpat (Jambi), huda (Minangkabau), kombi (Papua), cilokak (Lombok), and many others (Ministry of Education and Culture, 2017: 16).

These musical instruments and genre are part of the Indonesian traditional music. To understand the concept of Indonesian traditional music, it is important to analyze the definition of music. Music is a work of sound art in the form of songs or musical compositions expressing the thoughts and feelings of its creator through musical elements i.e., rhythm, melody, harmony, forms, and structure of songs and expressions as a whole (Jamalus, 1988). Meanwhile, tradition originates from Latin word tradêrê which means to go down or to pass down. The word tradition is commonly used to refer to the daily habit of society that is passed down from generation to generation. Therefore, the word traditional is defined as a behavior or attitude that clings to generational habits (Salim & Salim, 1991). This tradition complements local wisdom which according to Maryati & Suryawati makes the personality of a nation, which makes the nation able to absorb, even process cultures that come from outside.

From the above definitions, the term traditional music can be understood as music that has been passed down for generations, lives, and develops in a certain area (Tumbijo, 1977). Traditional has unique traits and reflects the culture of a certain ethnicity or people (Purba, 2007). More essentially, traditional music is an embodiment of cultural values according to the traditions of the people that adhere to it (Sedyawati, 1992). Therefore, Indonesian traditional music can be defined as the type of music that adopts the life and culture themes that exist in Indonesia.

The presence of traditional culture is often faced with the challenges of globalization and modernization that offer technological advancement and information openness. Globalization can be defined as the intensification of social relations that connect various phenomena around the world in such a way that the events that happen around us are formed by events that happen miles away and vice versa (Giddens, 1990: 64). Meanwhile, modernization is defined as the blending of a new system, that is considered more recent and superior, with a previous system that has been considered established (traditional), which is considered inferior (Pranadji & Simatupang, 2016: 3).

A number of studies have shown how globalization and modernization may have led to the extinction of a number of traditional cultures in Indonesia, such as the tradition of carrying Sasanggan in Anjir Serapat society (Darlan & Ilham, 2021), several traditional games in Tasikmalaya (Muslihin et al., 2021), and a number of local languages in Papua (Tondo, 2009). The extinction of these traditional cultures shows that the influx of globalization severely influences the life and mindset of younger generations to become more modern. Modern ideas make some of them think that something that is traditional such as traditional culture and art is something outdated. Another impact is that many younger generations consider that art from foreign countries is better and more interesting than traditional Indonesian art, and they also lack the awareness of the importance of preserving traditional art that is Indonesia's national identity (Nurhasanah et al., 2021).

As part of traditional Indonesian culture, traditional music also has similar challenges in the face of globalization and modernization. Some traditional music in some Indonesian regions is almost extinct or undergoing preservation efforts such as bamboo music in Kolai Village, South Sulawesi (Hernawati, 2017), Sasak traditional processional music (Yudarta & Pasek, 2015), senggayung music in Ketapang Regency, West Kalimantan (Harriska, 2018), rapa'i geurimpheng accompaniment music in Aceh (Hermaliza et al.,

248

2017), and some others. The problem does not include other traditional cultures claimed by Malaysia such as angklung, Reog Ponorogo, and the song Rasa Sayange (Hayat, 2012).

Although globalization and modernization are the main causes for the extinction of many traditional cultures, not only in Indonesia, but also around the world, it must be admitted that globalization and modernization also provide an "antidote" in the form of technological advancement. This technological advancement can be utilized to preserve traditional culture and at the same time to spread it in order to raise awareness and even to exert influence at global level. Some studies show how technological advancement, especially digital technology, can instead support traditional culture such as a study on cultural heritage preservation strategy through digitization (Agustinova, 2022), digitization of tangible and intangible cultural heritage (Purnawibawa et al., 2021), and establishment of Digital Library of Indonesian Culture/Perpustakaan Digital Budaya Indonesia (Kusumaningtiyas & Nurazizah, 2022).

Through these studies, it can be concluded that cultural heritage preservation efforts in today's age of advanced technology can be conducted through digitization. Digitization of cultural heritage is a form of technology utilization to preserve cultural heritage artifacts. This effort is considered as the right strategy for protecting cultural heritage from extinction in a more modern way. Through digitization, the fragile cultural heritage artifacts can be stored properly with more effective and efficient protection. Through digitization, cultural heritage data will be better documented compared to manual method. This also allows easier digital access to cultural heritage information (Agustinova, 2022: 3).

Traditional culture documentation effort is also supported by the state and is regulated in Law Number 11 of 2010 on Cultural Conservation and Law Number 5 of 2017 on Cultural Advancement. In Law Number 5 of 2017 on Cultural Advancement, precisely Article 18 clause (1) it is mentioned that everyone can carry out the documentation of Cultural Advancement Object, while in clause (2) it is mentioned that the government has a role of facilitating everyone to carry out the recording and documentation of Cultural Advancement Object. The Cultural Advancement Objects in question include oral traditions, manuscripts, customs, rituals, traditional knowledge, traditional technology, arts, languages, folk games, and traditional sports (Purnawibawa et al., 2021).

For clarity, the cultural heritage concept is classified into two categories, namely tangible heritage which has dimensional shape, can be physically touched, and usually has a functional aspect to support human activities, and intangible heritage, namely oral traditions, performing arts, rituals and ceremonies, community group knowledge, and creative skills (Sedyawati, 2002).

This research will focus more on cultural heritage in the form of traditional music and will propose a digital documentation model to maintain, preserve, and promote it to global level. The research objects chosen in this study come from several traditional music styles representing diversity from Sabang to Merauke. However, this study will only take one traditional music style from each of the five biggest

islands in Indonesia, namely Papua Island, Sulawesi Island, Kalimantan Island, Java Island, and Sumatra Island. Hopefully, the result of this study can also be used in other regions in Indonesia, including in the preservation of traditional music styles in regions that belong to small island category.

II. LITERATURE REVIEW

The literature review in this study will be related to two concepts, namely Indonesian traditional music and digitization of cultural legacy or heritage.

A. Traditional Indonesian Music

Traditional music found in ethnicities in Indonesia from Sabang to Merauke has its own distinction and characteristics. Most cultures were developed orally and passed from one generation to another as society evolved. The existence of traditional music is closely related to the way of life of the tribes or ethnicities inhabiting the land of Nusantara. Music is used as a medium to connect humans with nature, humans with humans, and humans with their God. In terms of its function in the society, it can be said that generally music is used as a social, entertainment, and ritual medium (Sukotjo, 2014). Traditional music has six functions: as a medium for custom ceremonies (rituals), dance accompaniment, medium for entertainment, medium for communication, medium for self-expression, and medium for economy (Ministry of Education and Culture, 2017: 8)

Traditional Indonesian music may refer to several things, namely traditional musical instruments (for example: angklung, gamelan), traditional music genres (gambang kromong, keroncong), traditional songs (Rasa Sayange, Potong Bebek Angsa, Apuse), and accompaniments for rites or other traditional cultural activities (senggayung music, rapa'i geurimpheng accompaniment music, Sasak traditional processional music) (Ministry of Education and Culture, 2017). Each of the elements or functions in the traditional Indonesian music will be discussed in points as follows:

- Traditional musical instruments

A characteristic feature of a traditional instrument is acoustics, which is the sound produced by the vibration of the instrument itself rather than electronic amplification. In general, traditional musical instruments are grouped into several categories, namely fretted/plucked string instruments, wind instruments, bowed string instruments, percussion instruments, metallophone instruments, and idiophone instruments (Ministry of Education and Culture, 2017: 19).

Examples of traditional fretted/plucked string instruments are sasando from Rote; kecapi from West Java, siter and celempung from Java, sape from East Kalimantan, japen from Central Kalimantan, tapin from South Kalimantan, talindo/tolindo or popondi and kecapi petik from South Sulawesi, santu from Central Sulawesi, guoto from Papua. Meanwhile, examples of traditional wind instruments are serangko from Jambi, seruling from Java, lalove from Central Sulawesi, tahuri and fu kerang from Maluku, and triton kerang from Papua. Examples of

traditional bowed string instruments are tehyan or tehyang Betawi from DKI Jakarta, rebab from Central Java and West Java, keso and geso-geso from South Sulawesi, tutuba from Central Sulawesi (Ministry of Education and Culture, 2017: 19 -21).

Examples of metallophone instruments are lado-lado and kolintang from Sulawesi, gambang from Jawa, tambur and bedhug, doll from Bengkulu, tambua from West Sumatra, gordang from North Sumatra, bende from Lampung, ceng-ceng from Bali, talempong from Minangkabau, some Javanese and Balinese gamelan instruments such as gender, saron, bonang, kempul, gong, etc. Meanwhile, percussion instruments are various kinds of gendang and tifa, guoto from Papua, and karinding from West Java. Idiophone instruments are various kinds of angklung and marakas (Ministry of Education and Culture, 2017: 21 – 22).

- Traditional music genre

    Traditional Indonesian genre or style of music emerged from cultural diversity, originating both from the local region itself and influences from outside of Indonesia such as gambus and kasidah from the Middle East, keroncong from Portugal, and dangdut from India. Examples of genres in Sundanese traditional music include Tembang Sunda or "seni mamaos cianjuran" played with kacapi indung, kacapi rincing, suling, and rebab; Jaipongan which is dance music from West Java with complex rhythm; Gambus which has Middle Eastern vibe developed since the 16th century; modern Qasidah which also has Middle Eastern vibe but is generally played with modern musical instruments; Kroncong which is a style of music developed from Portuguese music with such instruments as cak, cuk, cello, gitar, bas, and cello has dan langgam, stambul, or original formats; Javanese Langgam as a combination of kroncong and diatonic gamelan; gambang kromong, a typical Betawi music that uses percussion and brass instruments, tanjidor which also originates from Betawi with instruments such as tuba, trumpet, clarinet, tambourine, and drums (Yampolsky, 2020).

- Folk/traditional songs

    Folk songs or folk music or traditional songs are songs or music originating from a certain region which became popular and played by the people of the region and people from other regions. The writers of these folk songs are usually unknown (Ministry of Education and Culture, 2017). These folk songs or folk music are usually heard or sang or played according to the traditions in each region, such as to lull kids, during kids' games, folk entertainment, folk festivals, folk resistance, etc. (Sedyawati, 1992). At the moment there are approximately 439 folk songs from all of Indonesia (Hakim, 2020) some of them are Bungong Jeumpa (Aceh), Sinanggar Tulo (North Sumatra), Kampuang Nan Jauh di Mato (Sumatra Barat), Geding Sriwijaya (Palembang), Jali-Jali (Jakarta), Bubuy Bulan (Jawa Barat), Cublak Cublak Suweng (Jawa Timur), Ampar-Ampar Pisang (Kalimantan Selatan), Anging Mammiri (Sulawesi Selatan), and Yamko Rambe Yamko (Jayapura).

- Accompaniment for other traditional cultural activities

Just like in the study on music in the Isung Han Gandrong dance (Lawolio et al., 2022), Sasak traditional processional music (Yudarta & Pasek, 2015), senggayung music in Ketapang Regency, West Kalimantan (Harriska, 2018), or rapa'i geurimpheng accompaniment music in Aceh (Hermaliza et al., 2017), it is shown that some traditional Indonesian music styles also function as accompaniment music, namely to accompany or support processions or dance performances; as an illustration, to provide meaning and description of the dance work or processions being performed; as the artistic identity of a certain community to differentiate it from the artistic identity of other regions (Lawolio et al., 2022).

B. Digitization of Cultural Legacy/Heritage

In general, digitization is a process of trait transformation from physical and analog into virtual and digital (Siregar, 2019). Digitization is defined as the use of digital technology and digitized data to finish a job thereby influencing the process or the way it works. Digitized data is analog data that has been converted to digital through digitization. This data allows digitization to occur. Digitization prompts every activity to be carried out by utilizing digital media as the main tool. In other words, digitization changes a work method from manual to digital and electronic-based. This means digital system has replaced the traditional system and work method in order to finish various kinds of human task (Agustinova, 2022: 3).

Digitization can be implemented through various forms, one of them being a digital library. Digital library is a technology for connecting sources of open services from users and the information is stored in digital format (text, images, sound recordings, music, video, etc.) that is accessible via a network (Arms, 2000). Besides that, users can also access all sources of information needed from anywhere, anytime, and by any means (Jindal, 2010). Not only making it easier to access information, digital library is a part of preservation effort, especially because the sources of information available are stored in digital format. Digital sources are considered easier to preserve, especially due to the unlimited number of copies and longer lasting data (Jindal, 2010).

Besides that, digitization can also be achieved in the form of digital application (app). According to Maryono and Istiana (2007), an application (app) is a program developed to meet users' needs in carrying out a certain work. Some research for developing digital apps for the purpose of introducing or preserving traditional music or folk music has been conducted, including an app for learning and introducing traditional Indonesian musical instruments with text-to-speech ability based on Windows Phone (Airlangga, 2016), an app for introducing traditional Indonesian musical instruments using based marker augmented reality method based on Android (Ginting & Sofyan, 2017), and Virtual INMUINS (Indonesian Musical Instruments), an interactive app beased on mixed reality for introducing local Indonesian musical instruments (Hidayat et al., 2014).

III. RESEARCH METHOD

This research is qualitative research through library research. Qualitative research is defined as systematic arrangement, organization, and interpretation of textual material derived from interviews or observations. Qualitative research is used to find out the meanings of social phenomena experienced by the individual in the natural background (Malterud, 2001: 483).

Library research is conducted by collecting information and data with the help of reference books, results of similar previous research, articles, notes, and various journals related to research problems (Sari and Asmendri, 2020, p.44). Through qualitative approach, this research focuses on in-depth observation of a phenomenon with a natural background or according to the real situation. Sidiq and Choiri (2019, pp.

3-4) explained that qualitative research focuses on the quality of an event, phenomenon, or social tendency that may be useful for theory development. Through this approach, researcher tries to understand the phenomenon and provide an opinion on the strategy for the preservation of traditional music through digitization.

The result of this research will be a model for the documentation and preservation of traditional music in digital format. Meanwhile, a model is defined as a representation of an object, item, or idea in a simplified form of a natural condition or phenomenon. A model contains information about a phenomenon that is made for the purpose of studying the phenomenon of the actual system. A model may be an imitation of an actual object, system or event that contains only information that is considered important to be analyzed. (Achmad, 2008: 1).

TABLE I. Table of Location of Origin and the Explanation.

	Traditional musical instrument	Traditional music genre	Folk/ traditional song	Accompaniment for other cultural activities
Sumatra Island	Talempong (Minangkabau)	Huda (Minangkabau)	Ayam Den Lapeh (West Sumatra)	Musik pengiring Rapa'I Geurimpheng (Aceh)
Java Island	Karinding (West Java)	Tembang Sunda (West Java)	Cublak Cublak Suweng (East Java)	Jaipongan (West Java)
Kalimantan Island	Sape (East Kalimantan)	Senggayung music (West Kalimantan)	Ampar-Ampar Pisang (South Kalimantan)	Senggayung music (West Kalimantan)
Sulawesi Island	Talindo (Central Sulawesi)	Pakacaping (South Sulawesi)	Anging Mammiri (South Sulawesi)	Pakarena dance accompaniment music (South Sulawesi)
Papua Island	Guoto (West Papua)	Fuu (Merauke Regency)	Yamko Rambe Yamko (Jayapura)	Fuu (Merauke Regency)

The traditional Indonesian music to be studied will be categorized based on the five biggest islands in Indonesia and the categorization of elements and functions in traditional Indonesian music. It should be noted that these elements and functions in traditional Indonesian music may overlap and cross with each other due to the holistic and functional nature of traditional Indonesian music itself. The following research objects are chosen based on diversity consideration and the details are shown in Table I.

IV. UNITS DISCUSSION

As previously mentioned, digitization of traditional Indonesian music in this research is aimed at maintaining, preserving, and promoting traditional Indonesian music. Therefore, this digitization will take the form of an app containing education in the form of (1) digital library containing traditional Indonesian music and (2) interactive model of traditional Indonesian music. The proposed app will be able to present all kinds of information about traditional Indonesian music and at the same tim absorb data on traditional Indonesian music that is received from external sources such as melodies and sounds.

The discussion will start from the traditional Indonesian musical instrument column first:
• Digitization of Traditional Musical Instruments
Information about traditional musical instruments must be absorbed from two external sources: audio and visual. The digital app designed must be able to recognize the audio source from certain traditional musical instruments and to recognize the name and information about it. This is possible because whe software works by utilizing the Fast Fourier Transform algorithm to produce a graph of the recorded

sound frequency spectrum. From the graph of the sound frequency spectrum, the frequency value of the basic note and the number of harmonic frequencies that make up the sound color of a certain traditional musical instrument can be identified. This has been done in the research conducted by Kusuma S. and Mitrayana (2014) on saron sanga laras salendro.

The same method is also used to determine the frequency value of the basic note and the number of harmonic frequencies that make up the sound color of such musical instruments as talempong, karinding, sape, talindo, and guoto with Fast Fourier Transform algorithm which then will be stored in the app. When the app receives the sound frequency that is similar or close to it, it can immediately show the name of the traditional music.

In detecting the sound frequency, it is highly possible for the app to be mistaken in recognizing the identity of the traditional musical instrument being sounded due to factors such as sound quality and the amount of pressure on the hit/draw/strike/strum from the players who ring it. This can be overcome through active involvement of the user of the app themselves, especially those who are knowledgeable, therefore this app will also facilitate various forms of knowledge both from humans and non-humans. This success in measuring the sound frequency of talempong, karinding, sape, talindo, and guoto will subsequently be used to measure more sound frequencies from other musical instruments.

Next is the possibility to recognize and even to play traditional musical instrument based on external source in visual form. This research has been conducted by Ginting & Sofyan (2017) by using an augmented reality app installed

on an Android mobile platform, that worked by using an Android smartphone camera as an input to track and read a marker that has been made on a media such as a book or magazine through tracking system. After the marker has been read or tracked, a traditional musical instrument will then appear in 3D form and a virtual button will appear so that the user can recognize the traditional musical instrument based on its 3D shape and can play the notes based on the virtual button object being touched (Ginting & Sofyan, 2017)).

The Ginting & Sofyan (2017) research was adequate, but can only be applied on 2D shapes read from a book or magazine, while this research offers a model that can track and read a 3D object and also play it in augmented reality. Marker installation will be done on traditional musical instruments which are the objects of research i.e., talempong, karinding, sape, talindo, and guoto, before proceeding to various instruments so that the app can recognize more varieties of traditional musical instruments.

In general, information about traditional musical instruments is also contained in the app with references that can be accounted for and is managed collectively in an open collaboration system so that this digital app is also "democratic" in knowledge contribution. However, all knowledge contained in this digital app is still guarded by a number of gatekeepers that are considered competent in terms of knowledge and research about traditional Indonesian music.

• Digitization of Traditional Music Genres

It appears that there has not been adequate research on traditional music genres to do any recognition from external sources, therefore for the time being this digital app only contains information in the form of text and samples of works. The reason is that the traditional music genres are more fluid and dynamic, and can change through rearrangements or modifications of certain instruments.

However, in the future, it is possible to recognize traditional music genres under certain conditions that are considered ideal. This idea has been put forward in the research by Jondya & Iswanto (2018) who stated that certain genre of music can be recognized as long as the features of each audio data can be selected and extracted to find the

effective set of features. Most research in audio analysis is conducted by using the numerical values of features that represent an audio. In music signal, features are related to the main dimensions that are usually measured such as pitch, rhythm, harmony, melody, timbre, and spatial location. There are so many studies that recommend such feature calculation method, but there is a possibility that not all features are relevant for studying certain music, including traditional music genres (Jondya & Iswanto, 2018: 77).

Therefore, it is more feasible to provide information with open collaboration system just like providing information for traditional musical instruments.

Open collaboration on information about traditional music can be illustrated in Table II as follows.

TABLE II. Open Collaboration on Information about Traditional Music.

	Definition of Huda Music
Main description	Huda Music is nusantara traditional music originating from Minangkabau that developed since the arrival of Islam in Sumatra. Huda Music has Islamic vibe and is a combination of 3 styles of music, namely Dikil Rabaro, Salaulaik Dulang, and Dikil Mundan.
Collaboration 1	Huda Music is nusantara traditional music originating from Minangkabau that developed since the arrival of Islam in Sumatra. Huda Music has Islamic vibe and is a combination of 3 styles of music, namely Dikil Rabaro, Salaulaik Dulang, and Dikil Mundan.
Collaboration 2	Huda Music is nusantara traditional music originating from Minangkabau that developed since the arrival of Islam in Sumatra. Huda Music has Islamic vibe and is a combination of 3 styles of music, namely Dikil Rabaro, Salaulaik Dulang, and Dikil Mundan. Dikil Rabaro is vocal art with rabaro accompaniment, Salaulaik Dulang is an original instrument of Tanah Minang, while Dikil Mundan is an acculturation music with Islamic vibe that uses mandai accompaniment.

If there is additional information following the development of Huda music, users can include the addition as long as it refers to accountable sources. This indicates democratization in providing information about traditional music and gives users a sense of belonging in order to preserve traditional culture. This also applies to another research object i.e., Pakacaping (South Sulawesi) in Table III.

TABLE III. Pakacaping.

	Definition of Pakacaping
Main description	Pakacaping traditional music is a form of vocal instrumental music played by one person or more in pairs. In the performance, the kecapi player (pakacaping) plays a melodic instrument called kacaping (kecapi) while singing the song lyrics called kelong (song) in a manner called sibali-bali (replying to each other).
Collaboration 1	Pakacaping traditional music is a form of vocal instrumental music played by one person or more in pairs. In the performance, the kecapi player (pakacaping) plays a melodic instrument called kacaping (kecapi) while singing the song lyrics called kelong (song) in a manner called sibali-bali (replying to each other). The pakacaping traditional music performing art is a style of traditional music existing in four ethnic communities in South Sulawesi province, namely Mandar ethnicity, Toraja/Tator (Tana Toraja) ethnicity, Bugis ethnicity, and Makassar ethnicity. The pakacaping traditional music existing in South Sulawesi originates from the same ancestor, namely from Bugis Makassar sailors.
Collaboration 2	Pakacaping traditional music is a form of vocal instrumental music played by one person or more in pairs. In the performance, the kecapi player (pakacaping) plays a melodic instrument called kacaping (kecapi) while singing the song lyrics called kelong (song) in a manner called sibali-bali (replying to each other). The pakacaping traditional music performing art is a style of traditional music existing in four ethnic communities in South Sulawesi province, namely Mandar ethnicity, Toraja/Tator (Tana Toraja) ethnicity, Bugis ethnicity, and Makassar ethnicity. The pakacaping traditional music existing in South Sulawesi originates from the same ancestor, namely from Bugis Makassar sailors. However, its existence and development are different according to each ethnicity. The pakacaping traditional music existing in Makassar ethnic community in Gowa Regency, South Sulawesi province has gone through development both internally and externally. The development of pakacaping traditional music among Makassar ethnic community in Gowa was due to its use in the community as traditional entertainment music in big parties.

252

TABLE IV. Fuu

	Definition of Fuu
Main description	Fuu is a musical instrument played by blowing air into the hole or open part. Besides being used to call people, this musical instrument can also be used to accompany typical Papuan dances, especially those of Asmat tribe, Merauke Regency.
Collaboration 1	Fuu is a musical instrument played by blowing air into the hole or open part. Besides being used to call people, this musical instrument can also be used to accompany typical Papuan dances, especially those of Asmat tribe, Merauke Regency. The shape of this musical instrument is a combination of a flute and a tube because it has a fat shape with a hole at the tip, and is usually played in collaboration with other Papuan musical instruments such as Tifa or Kelambut.
Collaboration 2	Fuu is a musical instrument played by blowing air into the hole or open part. Besides being used to call people, this musical instrument can also be used to accompany typical Papuan dances, especially those of Asmat tribe, Merauke Regency. The shape of this musical instrument is a combination of a flute and a tube because it has a fat shape with a hole at the tip, and is usually played in collaboration with other Papuan musical instruments such as Tifa or Kelambut. Fuu is also used to hunt animals in the woods. The method is, before entering the jungle, some residents or people would climb up a tree to blow the Fuu. After an animal is seen approaching the Fuu sound, people would use weapons such as arrows and lances to kill the animal. After successfully hunting and getting out of the jungle, the Fuu would be blown once again to signal success in hunting animals such as boars or deers.

Another example about the fuu traditional music genre is shown in Table IV.

The knowledge in the form of text can also be coupled with audio and visual samples of the traditional music genre. Just like text, audio and visuals can also be included by users if they find relevant contents related to certain traditional music genres. Open collaboration in providing knowledge of traditional music genre can also be applied to other research objects such as "tembang sunda" and senggayung music. Irrelevant contents or information can be commented to or even reported by users themselves, in addition to the administrators of the digital app who also have prepared a number of gatekeepers considered competent to monitor the contents and information in the digital app.

• Digitization of Folk/Traditional Songs

With regard to digitization of folk songs, as has been done to traditional musical instruments, provision of information about folk/traditional songs is also possible through capture of external sources, namely audio. Research on this capture of external sources for folk/traditional songs has been done among others by Soetiman et al. (2021) by using Fast Fourier Transform that can change sound signal from the domain of time and space into the domain of frequencies which can be compared in order to find a match. The research showed that song search through melody alone can be done by using the Fast Fourier Transform with a precision of 12.46% and recall of 66.64% in 10 attempts.

This means, this digital app should be able to capture certain folk songs based on external audio source not only in the form of a song complete with its accompaniments and arrangements, but also in the form of mere chants/hums without any accompaniment. For example, if we come to a public place and the song Ayam Den Lapeh is played, the digital app should be able to recognize it immediately and present information about the song. Not only that, the lyrics of Ayam Den Lapeh can also be displayed at the same time.

However, the capture of the external sources must be preceded by a library of folk songs that is loaded into the app. Based on this, the provider of the digital app must first store as many libraries of folk songs as possible as reference. On the other hand, the digital app should also facilitate the users to allow them to provide inputs about certain folk songs that may have not been included in the library in the app itself. According to Hakim (2020), at the moment there are 439 folk songs from all regions throughout Indonesia.

• Digitization of Traditional Music as Accompaniment for Other Traditional Cultural Activities

As accompaniment for other traditional cultural activities, the function of traditional music in this case is usually tied to rituals and dances as a whole. Because of this, the information presented is often not only about the music, but also about the whole culture being presented. For examplle, the fuu from Merauke Regency may be a musical instrument, but may also refer to the music accompanying a dance and also animal hunting. As a whole, it refers to the functions of fuu not only as a musical instrument, but also other aspects of the society. This is just like referring to jaipongan as a dance only, whereas it also includes its distinctive music.

Therefore, users and the general public should have this knowledge of the unique characteristics of traditional Indonesian music. Traditional Indonesian music is not like the general western music that has a function of exclusively music, as in the case of the classical music that actually doesn't have any other purpose except for aesthetics. Traditional Indonesian music is often tied to the daily activities of the community and is inseparable. Even the traditional musicians themselves often are not those who we refer to as professional musicians, but may also be farmers, artisans, or other professions. This shows the characteristics of traditional Indonesian culture that is connected to livelihood of the people.

Therefore, the knowledge that may be presented in the digital app regarding traditional music as an accompaniment is textual information as is also presented in the traditional music genre. Similarly, the knowledge regarding this traditional music as an accompaniment is also expected to be written and presented based on the principle of open collaboration from the users in order to achieve democratization of knowledge.

This discussion on digital app does not only put forward the utilization of certain technology, but also tries to raise the democratic awareness of the Indonesian people. This means, with the spirit of open collaboration, knowledge is not owned by certain authorities only, but must be organically based on the community itself. Localized knowledge in the academic world, for example, especially in relation to traditional culture, should not be based only on research results of the academics only, but should also derive from actors of culture who experience it in their daily

lives. This is the fundamental spirit of this digital app and therefore it should be accessible as widely as possible and can even reach the tradition stakeholders and actors of traditional music. This means, this app must be made to become as user-friendly as possible.

Based on the above explanation, the documentation format for traditional music by using digital app can be illustrated in Figure I as follows.
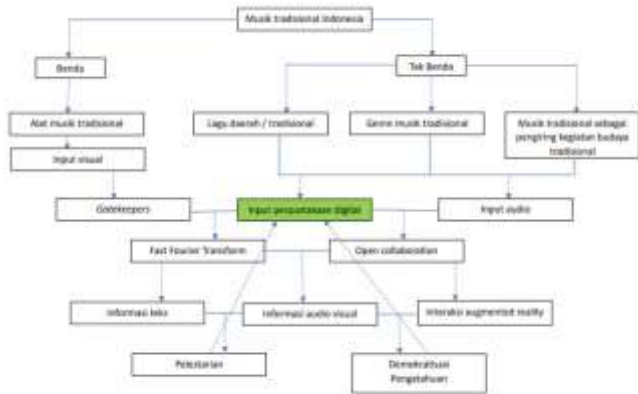

Fig. 1. Example of a figure caption.

Based on the above model, it can be explained that traditional Indonesian music consists of two categories that refer to cultural legacy or heritage: tangible and intangible. Of the four aspects of traditional Indonesian music i.e., traditional musical instruments, folk/traditional songs, traditional music genres, and traditional music as accompaniment for traditional cultural activities, only traditional musical instruments can be categorized as tangible because it can be seen and touched, whereas the other aspects belong to the intangible category due to their invisible and untouchable nature. Therefore, only the traditional musical instruments aspect can get visual and also audio inputs, while the other three aspects can only get audio input. However, all of these aspects of traditional Indonesian music can be connected into the digital library input that contains general information on traditional Indonesian music.

The gatekeepers in this case are selected by experts, academics, and also cultural actors who work to maintain all information related to traditional Indonesian music. But the information only needs to be monitored so that it is not erroneous or misleading, while maintaining the principle of open collaboration in the knowledge contribution. This principle of open collaboration makes all information output processed in the digital library the result of collective development by many Indonesians who are part of the app. Such collectivity is expected to generate a deeper sense of belonging of the traditional Indonesian music among the people.

In terms of digital technology itself, this app is expected to use Fast Fourier Transform to capture the main external source especially in the form of, so that the information can be subsequently presented in text format. In addition, audio visual information can also be presented to users about the

aspects of traditional music for more complete description. Referring to research by Ginting (2017), users' knowledge of traditional Indonesian music should also be coupled with possible interactions through augmented reality in order to provide them with some playing experience in learning about traditional Indonesian music.

The final result of this app model is the preservation of traditional Indonesian music amidst the challenges in this era of globalization and advanced digital technology, and also the application of the principle of knowledge democratization shown through open collaboration with regard to various kinds of information contained in digital libraries. By involving the users or the Indonesian people themselves in the collection, contribution, and presentation of information about traditional Indonesian music, they are expected to have a sense of pride and belonging towards traditional Indonesian music, which ultimately leads to the creation of nation's identity that will not be easily undermined or even claimed by other nations. At the end of this whole series should be the achievement of wealth of digital libraries that contain various knowledge of traditional Indonesian music, whether derived from academic research, cultural actors' lore, or input from the Indonesian people at large

V. CONCLUSION

Based on the discussion above, the conclusion of this research is as follows:

1. Traditional Indonesian music has four aspects: traditional musical instruments, traditional music genres, folk/traditional songs, and traditional music as accompaniment for other traditional cultural activities. This distinction determines how each aspect is treated for documentation in the digital app, including the technologies involved.

2. In developing a digital app for documentation of traditional music, the use of digital technology such as Fast Fourier Transform and also the involvement of the users themselves is necessary in order to add information within the framework of the open collaboration principles.

3. Digital app on documentation of traditional music should not be intended merely as a digital library that contains information, but should also lead to the principles of preservation and also democratization of knowledge.

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